BSC

Criteria/Basis Change Notice

Complete only applicable items.

1. QA: N/A QA
2. Page 1 of 4 3/5/08

3. Document Identifier:	4. Rev.:	5. CBCN:
000-3DR-MGR0-00100-000	007	009

6a. Title:	6b. Safety Classification of SSC:
Project Design Criteria Document	ITS and ITWI

7. Reason for Change:

ITEM 1:

Self Assessment OSA-EG-2008-008 identified that in CBCN 006-015 to PDC Revision 006, a note requiring adding the waste package methodology report for providing specific guidance and criteria references in PDC Sections 5.1.1 and 5.1.3 was not added to Section 5.1.3. CR 11712 was issued to document this. This CBCN adds the note. No potential technical impact noted.

ITEM 2:

This change is required to disconnect the PDC level criterion for curbs, drains, etc., from the NSDB requirements for moderator controls. Moderator control is part of the criticality safety basis for the entire GROA (IHF, RF, CRCF, WHF [outside the pool only], intrasite, including the aging pad, and subsurface). The SSCs relied upon to ensure moderator control change based on the facility. For example, in the CRCF moderator control is ensured based on canister shell and fire suppression system design; however, for subsurface, moderator control is ensured by the waste package shell only. Therefore, the PDC criterion on moderator control is changed to a "performance-based" criterion to avoid being overly restrictive. NUREG-1520 needs to be removed as it is not applicable to the Project. The exception to DOE O 420.1A [DIRS 159450] that 'the double contingency principle in Section 4.3.2(d) (1) may not be demonstrated' shall be removed. No potential technical impact noted.

8. Supersedes Change Notice: ☐ Yes If, Yes, Change Notice: _____ ☒ No

9. Disciplines/Organizations Affected by this Change:

Mechanical Discipline Engineering Manager 3/5/08	Nuclear Facilities Project Engineer RC Allen 05 MAR 08	Subsurface Facilities Project Engineer MLJ 3/5/08
Nuclear & Radiological Discipline Engineering Manager 3/4/08	Licensing & Nuclear Safety Document Review 3/4/08	
Preclosure Safety Analyses Manager for changes only	Environmental, Safety and Health Review Coordinator 3/05/08	
Civil/Structural/Architectural Discipline Engineering Manager 3/4/08	Thermal-Structural Analysis Discipline Engineering Manager 3/5/08	If 6b is ITS/ITWI: Quality Assurance: Quality Assurance DGT 03-05-2008 (DAN TUNNEY)

10. Description of Change:

Revise existing PDC criteria as stated below:

ITEM 1:

5.1.3 Waste Package Thermal Design Criteria

Waste package thermal design criteria shall be met as outlined throughout the BOD (BSC 2007 [DIRS 182131]) including thermal power requirements and temperature limits. The waste package, in concert with the canister containing the waste form, shall maintain the commercial SNF in an inert environment and limit the zircaloy peak cladding temperature below 400°C during normal aging (inerted environment) and short term loading operations (in air) and below 570°C during and accident condition involving a fire (inerted environment).

Note: *2001 ASME Boiler and Pressure Vessel Code*, Section II, does not contain an exhaustive list of material properties and it may be necessary to obtain values from other sources as appropriate. Possible additional sources of material properties are identified in *Waste Package Component Design Methodology Report* (BSC 2007 [DIRS 184505]), Sections 5.1 and 5.2

[RGA REG-CRW-RG-000454, Agreement for SFPO-ISG-11, Rev 3, Cladding Considerations for the Transportation and Storage of Spent Fuel (BSC 2007 [DIRS 181828]) provides agreement to utilize Interim Staff Guidance 11, Cladding Considerations for the Transportation and Storage of Spent Fuel (NRC 2003 [DIRS 170332]) for aging and short-term operations including TAD/cask drying and backfilling. Although the RGA does not specifically address waste packages, the criterion should also be applied to the SNF in waste packages. This assures waste packages will have sufficient heat removal capability without exceeding temperature limits for the various waste forms and waste package materials. Also see Section 6.2. ***CBCN 009 to Revision 007 added the note as a result of Self-Assessment OSA-EG-2008-008 and CR 11712]***

ITEM 2:

4.10.2.2 Facility Criticality Safety

For the Preclosure period, the repository surface nuclear facilities, mechanical handling systems, Subsurface Facility, and TAD canisters shall be designed to comply with the criticality criteria in DOE O 420.1A, *Facility Safety* [DIRS 159450], Section 4.3~~., except that the double contingency principle in Section 4.3.2(d) (1) may not be demonstrated.~~

[DOE O 420.1A [DIRS 159450] is allocated to Engineering through the requirements management system. ***The exception to the double contingency principle has been removed based on the following rationale:*ANSI/ANS-8.1-1998, *Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors* [DIRS 123801], *Section 4.2.2 states:***

> ***"Process designs should incorporate sufficient factors of safety to require at least two unlikely, independent and concurrent changes in process conditions before a criticality accident is possible."***

The Double Contingency Principle has always been recognized as a guide to the proper degree of protection against a criticality accident. Section 4.1.2 of ANSI/ANS-8.1-1998 provides the following overarching requirement, i.e., a "shall statement":

> ***"Before a new operation with fissionable materials is begun or before an existing operation is changed, it shall be determined that the entire process will be subcritical under both normal and credible abnormal conditions."***

Both this "requirement" and the Double Contingency Principle "guidance" play prominent roles in the DOE and NRC criticality safety regulations. In all cases the goal is accident prevention and the Double Contingency Principle provides important guidance in achieving this goal. The design of the surface facilities is based on the principles of double contingency; whereas, the quantitative event sequence-based analysis demonstrates compliance with 10 CFR Part 63 [DIRS 180319] (i.e., all operations shall be determined to be subcritical for normal operations and for individual event sequences with a mean probability of occurrence greater than or equal to one chance in 10,000 prior to permanent closure). CBCN009 to Revision 7 added this change] ~~*Although DOE O 420.1A identifies the double contingency principle, all facility and waste package designs are using the risk informed, performance based methodology as required by 10 CFR 63 [DIRS 180319], which takes precedence over DOE O 420.1A. The introduction to 10 CFR 63 actually uses the risk-informed, performance based terminology, and is consistent with the NRC policy statement in 60 FR 42622 [DIRS 103662], Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities: Final Policy Statement. The abstract of the Yucca Mountain Review Plan Final Report, NUREG-1804, Rev 2 (NRC 2003 [DIRS 163274]) indicates that 10 CFR 63 and the review plan are risk-informed, performance-based to the extent practical. Statement added for preclosure period in response to CR 10685. RGA REG-CRW-RG-000399, Agreement for NUREG-1804, Rev 2 Yucca Mountain Review Plan, Final Report (BSC 2007 [DIRS 182359]) adopted with clarification NUREG-1804 by mapping a crosswalk to the License Application.]*~~

4.10.2.6 ~~NUREG-1520 Guidance~~ Criticality Regulatory Guides

For the Preclosure period, ~~the repository Criticality Design should consider the guidance in NUREG-1520, *Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility* [DIRS 159567].~~ **Regulatory Guide 3.71, *Nuclear Criticality Safety Standards for Fuels and Materials Facilities* [DIRS 176331] shall be applied in criticality design.**

~~[This guidance is considered potentially applicable to the design of the repository based on expected functions. Statement added for preclosure period in response to CR-10685 and CBCN016 to Revision 6.~~

~~Note:~~

*~~The RGA for NUREG-1520 is being developed but not finalized, and is being used prior to final RGA adoption.~~ **This regulatory guide has been determined to be useful to the development of design products for the committed design. The level of conformance with regulatory positions in the regulatory guide will be determined during the design process and in the development of design products that are affected by this regulatory guide.** ~~Statement added for preclosure period in response to CR-10685 and CBCN016 to Revision 6.~~ **RGA REG-CRW-RG-000240, Agreement for Regulatory Guide 3.71 - Nuclear Criticality Safety Standards for Fuels and Materials Facilities (BSC 2007 [DIRS 182784]) has provided guidance for Regulatory Guide 3.71 [DIRS 176331] to use the ANSI/ANS-8.3-1997; R2003. 2003. American National Standard Criticality Accident Alarm [DIRS 176884] and ANSI/ANS-8.22-1997. American National Standard for Nuclear Criticality Safety Based on Limiting and Controlling Moderators [DIRS 158946] standards. NUREG-1520 [DIRS 159567] has been removed because it is not applicable to repository operations per Regulatory Guide Agreement REG-CRW-RG-000390, Agreement For NUREG-1520, March 2002, Standard Review Plan For The Review Of A License Application For A Fuel Cycle Facility - Final Report [DIRS 185183]. CBCN009 to Revision 7 added this change]***

4.10.2.6.1 Moderator Control

For the Preclosure period, where moderator control is needed for nuclear criticality safety, **the facilities in conjunction with the canisters, casks, overpacks, and waste packages shall be designed to provide for moderator** control in a manner consistent, where applicable, with ANSI/ANS-8.22.

. ~~during preclosure, the facility or waste package SSCs shall limit internal flooding by:~~

~~1. Limit the amount of moderator water or other similar fluid materials that may be present in any area where fissionable materials are being handled (cask unloading, storage areas, waste package loading area, and waste package closure area) to show that there is no criticality concern under all normal conditions, Category 1 event sequences, and Category 2 event sequences.~~

~~2. Have engineered barriers (e.g., seals, walls, barriers, curbs, and drains) to prevent moderator water or other similar fluid materials from other areas entering the area where fissionable materials are being handled, considering the potential hazards (e.g., seismic activity and fire fighting activities in adjacent areas) that could compromise the integrity of the engineered barriers.~~

~~3 Minimize the number of penetrations into moderator control areas where fissionable materials are being handled, and provide limits and controls as necessary to maintain the moderator control.~~

~~4. Design any instrumentation and controls, which are used to detect or prevent the presence of moderator water or other similar fluid materials, to fail safe and function under normal conditions, Category 1 event sequences, and Category 2 event sequences.~~

~~5. Limit the use of oils or other lubricants that may be present in any moderator control areas where fissionable materials are being handled to those that have no more moderating effect neutronic absorption characteristics than water~~

*[This criterion is based on ANSI/ANS-8.22-1997 [DIRS 158946]. Section 5. ~~and NUREG-1520 [DIRS 159567], Section 5.4.3.4.2. Item number 6 from the previous version of this criterion was deleted as a result of the change to the TAD canister-based repository disposal concepts.~~ The TAD canisters by definition are disposable without the addition of filler materials or additional moderator controls.~~ Statement added for preclosure period in response to CR-10685 and CBCN016 to Revision 6.~~ **NUREG-1520 [DIRS 159567] has been removed because it is not applicable to repository operations per Regulatory Guide Agreement REG-CRW-RG-000390, Agreement For NUREG-1520, March 2002, Standard Review Plan For The Review Of A License Application For A Fuel Cycle Facility - Final Report [DIRS 185183]. The PDC criterion on moderator control is changed to a "performance-based" criterion to avoid being overly restrictive. CBCN009 to Revision 7 added this change***]*

4.10.2.6.2 Design CSNF TAD Canisters for Verification of Neutron Absorber Material

For the Preclosure and Postclosure periods, SSCs shall be designed such that adequate controls and procedures can be effectively implemented to ensure that neutron absorber materials are inserted into the CSNF TAD canisters, as required, to meet preclosure criticality requirements and to meet the probability levels used in the criticality FEPs screening evaluation

[This criterion is based on ~~NUREG-1520 [DIRS 159567], Section 5.4.3.4.2 and~~ ANSI/ANS-8.21-1995 (R 2001) [DIRS 176893], Section 5. ~~Statement added for preclosure and postclosure periods in response to CR 10685 and CBCN016 to PDC Revision 6~~ ***NUREG-1520 [DIRS 159567] has been removed because it is not applicable to repository operations per Regulatory Guide Agreement REG-CRW-RG-000390, Agreement For NUREG-1520, March 2002, Standard Review Plan For The Review Of A License Application For A Fuel Cycle Facility - Final Report [DIRS 185183]. CBCN009 to Revision 7 added this change.]***

4.10.2.6.3 Design SSCs to Ensure Correct Loading of CSNF Assemblies

For the Postclosure period, SSCs shall be designed such that adequate controls and procedures can be effectively implemented to ensure correct loading of the CSNF assemblies into a TAD canister as prescribed by the derived TAD canister loading curves, to meet the probability levels used in the criticality FEPs screening evaluation.

[This criterion is based on ***the Disposal Criticality Analysis Methodology Topical Report (YMP 2003 [DIRS 165505], Section3.6.1.*** *~~NUREG-1520 [DIRS 159567], Section 5.4.3.4.2. Statement added for postclosure period in response to CR 10685. CBCN016 to Revision 6 provided the period statement.~~* ***NUREG-1520 [DIRS 159567] has been removed because it is not applicable to repository operations per Regulatory Guide Agreement REG-CRW-RG-000390, Agreement For NUREG-1520, March 2002, Standard Review Plan For The Review Of A License Application For A Fuel Cycle Facility - Final Report [DIRS 185183].. CBCN009 to Revision 7 added this change]***

4.10.2.6.4 Ensure TAD Canister Closure Precludes Moderator Intrusion

For the Preclosure and Postclosure periods, SSCs shall be designed such that adequate controls and procedures can be effectively implemented to ensure closure of the TAD canister is performed in a manner to preclude moderator intrusion unless the proposed quantity of moderator material can be shown to impose no criticality concerns through providing moderation (preclosure) or enhanced corrosion (postclosure).

[This criterion is based on ***ANSI/ANS-8.22-1997 [DIRS 15894], Section 5.*** *~~NUREG-1520 [DIRS 159567], Section 5.4.3.4.2. Statement added for preclosure and postclosure periods in response to CR 10685 and CBCN016 to Revision 6.~~* ***NUREG-1520 [DIRS 159567] has been removed because it is not applicable to repository operations per Regulatory Guide Agreement REG-CRW-RG-000390, Agreement For NUREG-1520, March 2002, Standard Review Plan For The Review Of A License Application For A Fuel Cycle Facility - Final Report [DIRS 185183]. CBCN009 to Revision 7 added this change]***

4.10.2.8 ~~Criticality Regulatory Guides~~ NOT USED – Moved to 4.10.2.2

~~For the Preclosure period, Regulatory Guide 3.71, *Nuclear Criticality Safety Standards for Fuels and Materials Facilities* [DIRS 176331] should be applied in criticality design.~~

~~*[This regulatory guide has been determined to be useful to the development of design products for the committed design. The level of conformance with regulatory positions in the regulatory guide will be determined during the design process and in the development of design products that are affected by this regulatory guide. Statement added for preclosure period in response to CR 10685 and CBCN016 to Revision 6. RGA-REG-CRW-RG-000240, Agreement for Regulatory Guide 3.71 – Nuclear Criticality Safety Standards for Fuels and Materials Facilities (BSC 2007 [DIRS 183187]) has provided guidance for Regulatory Guide 3.71 to use the ANSI/ANS-8.3-1997 and Project Design Criteria Document* 000-3DR-MGR0-00100-000-007 Page 189 of 270 October 2007 *ANSI/ANS-8.22-1997 standards.* ***CBCN009 to Revision 7 added this change.]***~~

11.	REVIEWS AND APPROVAL		
Printed Name	**Title**	**Signature**	**Date**
11a. Preparer: David S. Rhodes	Discipline Engineering Manager		3-5-08
11b. Concurrence: Richard Foster	Manager of Discipline Engineering		3-5-08
11c. Concurrence: N/A	Project Engineering Manager	N/A	N/A
11d. Approved: Barbara Rusinko	Engineering Manager		3/5/08